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## 6. AUTHOR(S)

KURT OUGHSTUN

## 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

UNIVERSITY OF VERMONT  
ELECTRICAL ENGINEERING & MATHEMATICS  
BURLINGTON, VERMONT 05405-0156

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FINAL TECHNICAL REPORT  
EPSCoR Grant # F49620-92-J-0419

A Research Program on the  
Asymptotic Description of Dispersive Pulse Propagation

Kurt E. Oughstun  
Principal Investigator  
Professor of Electrical Engineering & Mathematics  
University of Vermont  
Burlington, Vermont 05405-0156

This grant was used to continue support of our graduate level research program into the complete asymptotic description of electromagnetic pulse propagation in causally dispersive media and waveguiding systems. Our long-term research goal in this important area is to develop a rigorous, uniform asymptotic description of ultra-wideband electromagnetic pulse propagation, reflection, and transmission phenomena in both lossy dielectric and conducting dispersive media that is valid for arbitrarily short rise-time pulses.

One of my students whose research was partially supported by this grant has successfully defended her Ph.D. dissertation on "*Plane Wave Pulse Propagation in a Linear, Causally Dispersive Polar Medium*", the results of which are presented in the pair of papers (preprints attached):

*J.E.K. Laurens and K.E. Oughstun, "Asymptotic Description of Ultra-Wideband Plane Wave Pulse Propagation in Triply-Distilled Liquid Water. Part I: A Causal, Analytic Model of the Frequency Dispersion of the Dielectric Permittivity," IEEE Transactions on Antennas and Propagation, (submitted).*

*J.E.K. Laurens and K.E. Oughstun, "Asymptotic Description of Ultra-Wideband Plane Wave Pulse Propagation in Triply-Distilled Liquid Water. Part II: The Impulse Response and Its Description in Terms of the Separate Dispersion Mechanisms," IEEE Transactions on Antennas and Propagation, (submitted).*

Another of my students whose research was supported by this grant has successfully defended his Ph.D. dissertation on "*Energy Dissipation of Pulsed Electromagnetic Fields in Causally Dispersive Dielectrics*", the results of which are presented in the papers (copies attached):

*P.D. Smith and K.E. Oughstun, "Electromagnetic Energy Dissipation of Ultrawideband Plane Wave Pulses in a Causal, Dispersive Dielectric," in Ultra-Wideband, Short-Pulse Electromagnetics 2, edited by L. Carin and L.B. Felsen (Plenum Press, 1995) pp. 285-295.*

*P.D. Smith and K.E. Oughstun, "Electromagnetic Energy Dissipation and Propagation of an Ultrawideband Plane Wave Pulse in a Causally Dispersive Dielectric," IEEE Transactions on Antennas and Propagation, (submitted).*

The final student who was supported by this grant is completing his research on pulse propagation in lossy dielectric waveguiding systems. The initial results of his research have been submitted for presentation (and subsequent publication) at the *Third International Conference on Ultra-Wideband, Short-Pulse Electromagnetics*.